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In re patent application of:

Ranjit Bhatia et al.

For: SYSTEM AND METHOD FOR ADAPTIVE CONFIGURATION OF CELL STRUCTURE BASED ON THE POSITION OF MOBILE STATIONS

BOX PATENT APPLICATION
Assistant Commissioner
  for Patents
Washington, D.C. 20231

Sir:

PATENT APPLICATION TRANSMITTAL LETTER

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X   Specification, claims and abstract of the above-referenced patent application (total of 32 pages)

X   _4_ sheet(s) of drawing(s) (_X_ formal/__ informal).

X   Combined Declaration and Power of Attorney (unexecuted).

___   An Assignment of the invention to:

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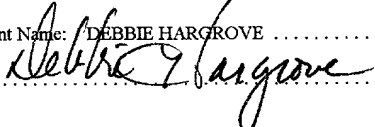
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SYSTEM AND METHOD FOR ADAPTIVE CONFIGURATION OF CELL STRUCTURE BASED ON THE POSITION OF MOBILE STATIONS

BACKGROUND OF THE PRESENT INVENTION

Field of the Invention

The present invention relates generally to telecommunications systems and methods for reducing interference in cellular networks, and specifically to configuring the cell structure in cellular networks in order to reduce interference.

Background of the Present Invention

In modern cellular systems, the quality of the radio network highly depends upon the interference level in the network. The interference level is usually defined by the carrier to interference (C/I) ratio, which is the ratio of the level of the received desired signal to the level of the received undesired signal. The undesired signal can be a signal of the same frequency from a different cell (co-channel interference) or a signal of an adjacent frequency from a different cell (adjacent channel interference). In either case, the distribution of the C/I ratio throughout the network determines the type of frequency re-use pattern used in the network.

Since the number of frequencies available for cellular telecommunications are limited, frequency re-use patterns are necessary to provide cellular coverage to a geographic region. Frequency re-use is defined as the use of radio channels on the same carrier frequency, covering geographically different areas. Conventionally, these areas must be separated from each

other by a sufficient distance in order to avoid co-channel interference.

However, various mechanisms, such as frequency hopping, power control and DTX, have been developed to

5 reduce the interference in the cellular network without requiring an increase in the number of utilized frequency groups. Therefore, some cellular networks have been able to apply aggressive frequency re-use patterns, such as the 1/3 pattern, which uses only

10 three frequency groups in a single site re-use pattern. These aggressive frequency re-use patterns also provide increased traffic capacity in the networks.

As is understood in the art, the traffic capacity in a cellular network can be increased by utilizing

15 more frequencies or reducing the frequency re-use distance. If the number of available frequencies is limited, the only way to increase the capacity without building new sites is to reduce the frequency re-use distance. However, reducing the frequency re-use

20 distance typically increases the interference in the network. Therefore, in addition to, or instead of,

implementing an aggressive frequency re-use pattern, an overlaid/underlaid sub-cell structure can be introduced in order to increase the radio network capacity.

The overlaid/underlaid (OL/UL) sub-cell structure

5   adds a second frequency re-use pattern to the cellular network with a shorter re-use distance than the existing re-use pattern. The cells using this second re-use pattern are typically restricted in size (lower power) to make a shorter re-use distance possible

10   without creating excessive interference. These cells are termed overlaid sub-cells. The original cells that have overlaid cells associated with them are termed underlaid sub-cells.

This OL/UL sub-cell structure is created by

15   dividing the available frequencies in the cellular network between the overlaid and underlaid sub-cells. Each overlaid sub-cell serves a smaller area than the corresponding underlaid sub-cell. Consequently, the number of frequencies per cell can be increased, thus

20   providing an increased traffic capacity in the network without building new sites or adding more frequencies.

However, the OL/UL sub-cell structure only works when some of the mobile subscribers are positioned close to the base station. Therefore, in cases where many or all of the mobile subscribers are located near

5   the corners of the cell, away from the base station, the OL/UL sub-cell structure may not provide any real benefit to the network operator or the mobile subscriber. Therefore, there is a need to adaptively switch between the OL/UL sub-cell structure and a

10   normal cell structure, based on the relative position of the mobile subscribers in the cell.

SUMMARY OF THE INVENTION

The present invention is directed to

15   telecommunications systems and methods for adaptively configuring the cell structure of a cell having at least two carrier frequencies between the OL/UL sub-cell structure and the normal cell structure, based on the position of the mobile stations within the cell.

20   The Base Station Controller (BSC) determines the position of the mobile stations within the cell

relative to the Base Transceiver Station (BTS) location. If the number of mobile stations within a predefined distance from the BTS is greater than a channel threshold, the BSC adapts the cell

5   configuration to the OL/UL sub-cell structure. The channel threshold is an operator-defined percentage of available channels (throughout the cell or within either the overlaid or underlaid cell). However, if the BSC determines that the percentage of mobile

10 stations closer than the predefined distance is less than the channel threshold, the BSC maintains the normal cell structure. Advantageously, embodiments of the present invention reduce the interference and complexity in the cellular network, while at the same

15 time, increasing the cellular network quality and capacity.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosed invention will be described with reference to the accompanying drawings, which show important sample embodiments of the invention and which

5 are incorporated in the specification hereof by reference, wherein:

FIGURE 1 is a flow diagram illustrating the steps for adaptively configuring the cell structure between an overlaid/underlaid (OL/UL) sub-cell structure and a

10 normal cell structure in accordance with preferred embodiments of the present invention;

FIGURE 2 is a block diagram illustrating the OL/UL sub-cell structure in accordance with embodiments of the present invention;

15 FIGURE 3 is a block diagram illustrating the normal cell structure; and

FIGURE 4 is a block diagram of a base station controller configured to adaptively switch between the OL/UL sub-cell structure and the normal cell structure.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EXEMPLARY EMBODIMENTS

The numerous innovative teachings of the present
5   application will be described with particular reference
to the presently preferred exemplary embodiments.
However, it should be understood that this class of
embodiments provides only a few examples of the many
advantageous uses of the innovative teachings herein.
10   In general, statements made in the specification of the
present application do not necessarily delimit any of
the various claimed inventions.   Moreover, some
statements may apply to some inventive features but not
to others.

15   With reference now to the steps listed in FIGURE
1 of the drawings, which will be described in
connection with FIGURES 2-4 of the drawings, a
mechanism for adaptively configuring a cell 22 having
at least two carrier frequencies (f1 and f2) associated
20   therewith is shown.   As a first step, the network
operator for the cell 22 must first define a distance
threshold 25 (step 100). This distance threshold 25 is

preferably associated with a specific radial distance from a Base Transceiver Station (BTS) 24, as is shown in FIGURE 2. The BTS 24 is shown for simplicity as an antenna, but should be understood to include all radio

5   equipment needed for the cell 22.

As a next step, the network operator must also define a channel threshold 26 (step 110), which corresponds to an operator-defined number of traffic channels that are either in use or available. The

10   decision as to whether the channel threshold 26 is associated with the number of available traffic channels or the number of traffic channels in use is also made by the network operator. Once defined, both the channel threshold 26 and the distance threshold 25

15   are stored in a Base Station Controller (BSC) 23 serving the BTS 24, as shown in FIGURES 2-4.

It should be understood that traffic channels carry speech and other data between the BTS 24 and Mobile Stations (MS's) 20a and 20b, which are the

20   equipment used by the mobile subscribers to communicate with the cellular network. These traffic channels are

a type of logical channel that is mapped onto a time slot of a specific carrier frequency f1 and f2. The number of time slots depends upon the type of cellular system. For example, in the Global System for Mobile

5 Communications (GSM) system, each carrier frequency f1 and f2 is divided into eight time slots, with at least one time slot reserved for signaling information between the BTS 24 and the MS's 20a and 20b and the other seven time slots available as traffic channels.

10 Thus, the channel threshold 26 represents a percentage of logical channels allocated as traffic channels that are either in use or available. In addition, the channel threshold 26 can be set based upon the total number of traffic channels for all of

15 the available carrier frequencies f1 and f2 in the cell 22, or upon only the number of traffic channels for one or more of the available carrier frequencies f1 or f2 in the cell 22.

The channel threshold 26 distinguishes between a

20 cell 22 that has a number of MS's, e.g., MS 20a, close to the BTS 24, in which case an overlaid/underlaid

(OL/UL) sub-cell structure can be applied, and a cell 22 that does not have many MS's, _e.g._, MS 20b, close to the BTS 24, in which case the normal cell structure should be applied. The OL/UL sub-cell structure works

5   well in the situation where a number of MS's 20a are close to the BTS 24. If there were few or no MS's 20a close to the BTS 24, changing to an OL/UL sub-cell structure would not be beneficial, as the traffic capacity in the cell would be effectively decreased.

10   Once the distance threshold 25 and channel threshold 26 are defined, the process of adaptively configuring the cell 22 can begin. Initially, the BSC 23 starts with the normal cell structure, in which all of the available carrier frequencies f1 and f2 are

15   active across the entire area of the cell 22. Thereafter, as shown in FIGURE 4, measurement logic 400 within the BSC 23 measures a distance D1 and D2 of each of the MS's 20a and 20b, respectively, involved in a call connection in the cell 22 from the BTS 24 (step

20   120). For example, the BSC 23 can obtain a respective Timing Advance (TA) value from each of the MS's 20a and

20b, which provides the BSC 23 with a respective radius around the BTS 24 that each of the MS's 20a and 20b is located within, and use these respective radius' as the distance measurements D1 and D2, respectively.

5   Alternatively, the BSC 23 can obtain coordinate location information for each of the MS's 20a and 20b using a network-based positioning method or an MS-based positioning method, such as the Global Positioning System (GPS), and determine the respective distance D1

10 and D2 from the BTS 24 based upon this coordinate location information.

Once the distance from the BTS 24 for each of the MS's 20a and 20b involved in a call connection is known (step 120), as shown in FIGURE 4, the BSC 23 inputs

15 each of these measured distances D1 and D2 to comparison logic 410, which compares each of these distances D1 and D2 with the distance threshold 25 to determine the number of MS's 20a and 20b having a respective distance D1 and D2 from the BTS 24 less than

20 the distance threshold 25 (step 130). For example, the

distance threshold 25 can be the radius of a desired
underlaid sub-cell 22b, as shown in FIGURE 2.

Thereafter, the BSC 23 inputs the determined
number of MS's 20a and 20b having a distance D1 and D2,
5   respectively, from the BTS 24 less than the distance
threshold 25 to additional comparison logic 420, which
compares this number to the channel threshold 26 (step
140) to determine whether to change the cell structure
to the OL/UL sub-cell structure (step 150). If the
10   additional comparison logic 420 determines that the
structure of the cell 22 should be changed to the OL/UL
sub-cell structure, an output 422 of the additional
comparison logic 420 goes to configuration logic for
the OL/UL sub-cell structure 430, and the cell
15   structure is changed to the OL/UL sub-cell structure
(step 160). Otherwise, an output 424 of the additional
comparison logic 420 goes to configuration logic for
the normal cell structure 435, and the normal cell
structure is maintained (step 170).

20   In one embodiment, if the channel threshold 26 is
defined as a certain number of traffic channels in use,

and if the number of MS's 20a having a distance D1 less than the distance threshold 25 is greater than the channel threshold 26, the output 422 from the additional comparison logic 420 goes to the

5   configuration logic 430 that changes the cell structure to the OL/UL sub-cell structure. For example, if the channel threshold 26 is three traffic channels in use, and there are five MS's involved in call connections within the cell 22, four of which have a distance less

10   than the distance threshold 25, the BSC 23 would change to an OL/UL sub-cell structure.

In an alternative embodiment, if the channel threshold 26 is defined as a certain number of available traffic channels, the BSC 23 would change to

15   an OL/UL sub-cell structure only when the number of MS's 20a and 20b involved in call connections having a distance D1 and D2, respectively, to the BTS 24 less than the distance threshold 25 is less than the channel threshold 26. For example, if the channel threshold 26

20   is five traffic channels available, and there are five MS's involved in call connections within the cell 22,

four of which have a distance less than the distance

threshold 25, the BSC 23 would change to an OL/UL sub-

cell structure.

An example of an OL/UL sub-cell structure is shown

5   in FIGURE 2.   Since the BTS 24 has at least two

separate Transceiver Units (TRUs) TRU1 and TRU2, each

having a different carrier frequency f1 and f2,

respectively, associated therewith, TRU1, which has

frequency f1 associated therewith, becomes associated

10   with an underlaid sub-cell 22a, which serves the entire

area of the cell 22.   In addition, TRU2, which has

frequency f2 associated therewith, becomes associated

with an overlaid sub-cell 22b, which serves a smaller

area of the cell 22 than the underlaid sub-cell 22a.

15   This OL/UL sub-cell structure is accomplished by

lowering the BTS 24 power of TRU2 with respect to the

BTS 24 power of TRU1.   Advantageously, by changing to

an OL/UL sub-cell structure, the traffic capacity in

the cell 22 remains the same, but the interference in

20   the cell 22 decreases, due to the smaller size of the

overlaid sub-cell 22b (increased frequency re-use distance).

An example of a normal cell structure is shown in FIGURE 3. The normal cell structure has multiple TRU's TRU1 and TRU2, each with the same power, so that all of the carrier frequencies f1 and f2, respectively, can serve the same area (the entire area of the cell 22). In this case, any MS 20a or 20b anywhere in the cell 22 can be assigned to a traffic channel on either TRU1 or TRU2, and thus communicate with the BTS 24 over either available carrier frequency f1 or f2, respectively. Although the traffic capacity in the normal cell structure is the same as in the OL/UL sub-cell structure, the interference in the normal cell structure may increase due to the shorter frequency re-use distance of all carrier frequencies f1 and f2.

It should be understood that although the BTS 24 is shown at the center of the cell 22 in FIGURES 2 and 3, in different frequency re-use patterns, such as the 3/9 and 4/12 patterns, the BTS 24 may be located at an intersection between three cells, with the BTS 24

having three antenna pointing azimuths (not shown), one for each cell. In these situations, the overlaid sub-cell 22b usually extends radially out from the intersection of the three cells to a diameter smaller than the diameter of the underlaid sub-cell 22a. Therefore, in order to accommodate these type of frequency re-use patterns, instead of defining a specific distance from the BTS 24 as the distance threshold 25, the distance threshold 25 can be a function describing the shape of the desired overlaid sub-cell 22b.

With reference again to the steps listed in FIGURE 1, and the BSC 23 diagram of FIGURE 4, once the cell 22 has been configured, the BSC 23 can either repeat the process immediately, or preferably, to reduce the amount of processing within the BSC 23, the BSC can initialize a timer 440 having a period set by the network operator (step 180). Upon the expiration of the timer 440 (step 190), the BSC 23 repeats the process, and obtains new distance measurements D1 and

D2 for all MS's 20a and 20b currently involved in a call connection in the cell 22 (step 120).

As will be recognized by those skilled in the art, the innovative concepts described in the present application can be modified and varied over a wide range of applications. Accordingly, the scope of patented subject matter should not be limited to any of the specific exemplary teachings discussed, but is instead defined by the following claims.

WHAT IS CLAIMED IS:

1   1.   A base station controller for adaptively

2   configuring the structure of a cell served by said base

3   station controller, said cell having a plurality of

4   mobile stations located therein and a base transceiver

5   station associated therewith, said base transceiver

6   station having at least two carrier frequencies

7   associated therewith, said base station controller

8   comprising:

9   measurement logic adapted to determine a

10   respective distance of each of said mobile stations

11   involved in a call connection within said cell from

12   said base transceiver station;

13   first comparison logic adapted to compare each

14   said respective distance to a distance threshold to

15   determine a number of said mobile stations having said

16   respective distance less than or equal to said distance

17   threshold;

18   second comparison logic adapted to perform a

19   comparison of said number to a channel threshold; and

20   configuration logic adapted to switch between an

21 overlaid/underlaid sub-cell structure having at least

22 one of said at least two carrier frequencies serving

23 only a portion of said cell and a normal cell structure

24 having all of said at least two carrier frequencies

25 serving the entire area of said cell based on the

26 results of said comparison.

1   2.   The base station controller of Claim 1,

2   wherein said channel threshold is a number of traffic

3   channels in use.

1   3.   The base station controller of Claim 2,

2   wherein said configuration logic is adapted to switch

3   to said overlaid/underlaid sub-cell structure when the

4   results of said comparison indicate that said number of

5   said mobile stations having said respective distance

6   less than or equal to said distance threshold is

7   greater than or equal to said channel threshold.

1   4.   The   base   station   controller   of   Claim   1,

2 wherein said channel threshold is a number of traffic

3 channels available.

1   5.   The   base   station   controller   of   Claim   4,

2 wherein said configuration logic is adapted to switch

3 to said overlaid/underlaid sub-cell structure when the

4 results of said comparison indicate that said number of

5 said mobile stations having said respective distance

6 less than or equal to said distance threshold is less

7 than or equal to said channel threshold.

1   6.   The   base   station   controller   of   Claim   1,

2 further comprising:

3   a timer, said measurement logic being adapted to

4 begin measuring each said respective distance upon the

5 expiration of said timer.

1   7.   The   base   station   controller   of   Claim   1,

2   wherein   each   said   respective   distance   is   a   radius

3   around   said   base   transceiver   station,   said   distance

4   threshold   being   an   additional   radius   around   said   base

5   transceiver   station.

1   8.   The   base   station   controller   of   Claim   1,

2   wherein   each   said   respective   distance   is   a   specific

3   distance   from   said   base   transceiver   station,   said

4   distance   threshold   being   a   radius   around   said   base

5   transceiver   station.

1   9.   The   base   station   controller   of   Claim   1,

2   wherein   each   said   respective   distance   is   a   specific

3   distance   from   said   base   transceiver   station,   said

4   distance   threshold   being   a   function   describing   the

5   shape   of   an   overlaid   sub-cell   of   said

6   overlaid/underlaid   sub-cell   structure.

1   10. The base station controller of Claim 1,

2   wherein said channel threshold is based on the number

3   of traffic channels associated with only one of said at

4   least two carrier frequencies.

1   11. The base station controller of Claim 1,

2   wherein said channel threshold is based on the number

3   of traffic channels associated with at least two of

4   said at least two carrier frequencies.

1   12. A telecommunications system for adaptively

2 configuring the structure of a cell within a cellular

3 network, said cell having a plurality of mobile

4 stations located therein, said telecommunications

5 system comprising:

6   a base transceiver station within said cell in

7 wireless communication with said plurality of mobile

8 stations, said base transceiver station having at least

9 two carrier frequencies associated therewith; and

10   a base station controller connected to said base

11 transceiver station, said base station controller being

12 adapted to measure a respective distance of each of

13 said mobile stations involved in a call connection

14 within said cell from said base transceiver station,

15 compare each said respective distance to a distance

16 threshold to determine a number of said mobile stations

17 having said respective distance less than or equal to

18 said distance threshold, perform a comparison of said

19 number to a channel threshold and switch between an

20 overlaid/underlaid sub-cell structure having at least

21 one of said at least two carrier frequencies serving

22   only a portion of said cell and a normal cell structure

23   having all of said at least two carrier frequencies

24   serving the entire area of said cell based on the

25   results of said comparison.

1   13. The telecommunications system of Claim 12,

2   wherein said channel threshold is a number of traffic

3   channels in use.

1   14. The telecommunications system of Claim 13,

2   wherein said base station controller is adapted to

3   switch to said overlaid/underlaid sub-cell structure

4   when the results of said comparison indicate that said

5   number of said mobile stations having said respective

6   distance less than or equal to said distance threshold

7   is greater than or equal to said channel threshold.

1   15. The telecommunications system of Claim 12,

2   wherein said channel threshold is a number of traffic

3   channels available.

1   16. The telecommunications system of Claim 15,

2   wherein said base station controller is adapted to

3   switch to said overlaid/underlaid sub-cell structure

4   when the results of said comparison indicate that said

5   number of said mobile stations having said respective

6   distance less than or equal to said distance threshold

7   is less than or equal to said channel threshold.

1   17. The telecommunications system of Claim 12,

2   wherein said base station controller further comprises

3   a timer, said base station controller being adapted to

4   begin measuring each said respective distance upon the

5   expiration of said timer.

1   18. The telecommunications system of Claim 12,

2   wherein each said respective distance is a radius

3   around said base transceiver station, said distance

4   threshold being an additional radius around said base

5   transceiver station.

1   19. The telecommunications system of Claim 12,

2   wherein each said respective distance is a specific

3   distance from said base transceiver station, said

4   distance threshold being a radius around said base

5   transceiver station.

1   20. The telecommunications system of Claim 12,

2   wherein each said respective distance is a specific

3   distance from said base transceiver station, said

4   distance threshold being a function describing the

5   shape of an overlaid sub-cell of said

6   overlaid/underlaid sub-cell structure.

1   21. The telecommunications system of Claim 12,

2   wherein said base transceiver station has at least two

3   transceiver units associated therewith, each of said at

4   least two transceiver units having a respective one of

5   said at least two carrier frequencies associated

6   therewith.

1   22.   The telecommunications system of Claim 21,

2   wherein said base station controller is adapted to

3   switch to said overlaid/underlaid sub-cell structure by

4   reducing the power to at least one of said at least two

5   transceiver units.

1   23. A method for adaptively configuring the

2   structure of a cell served by a base station

3   controller, said cell having a plurality of mobile

4   stations located therein and a base transceiver station

5   associated therewith, said base transceiver station

6   having at least two carrier frequencies associated

7   therewith, said method comprising the steps of:

8   determining a respective distance of each of said

9   mobile stations involved in a call connection within

10   said cell from said base transceiver station;

11   comparing each said respective distance to a

12   distance threshold to determine a number of said mobile

13   stations having said respective distance less than or

14   equal to said distance threshold;

15   performing a comparison of said number to a

16   channel threshold; and

17   switching between an overlaid/underlaid sub-cell

18   structure having at least one of said at least two

19   carrier frequencies serving only a portion of said cell

20   and a normal cell structure having all of said at least

21   two carrier frequencies serving the entire area of said

22   cell based on said step of performing.

1   24. The method of Claim 23, wherein said channel

2   threshold is a number of traffic channels in use, said

3   step of switching further comprising the step of:

4   switching to said overlaid/underlaid sub-cell

5   structure when the results of said comparison indicate

6   that said number of said mobile stations having said

7   respective distance less than or equal to said distance

8   threshold is greater than or equal to said channel

9   threshold.

1   25. The method of Claim 23, wherein said channel

2   threshold is a number of traffic channels available,

3   said step of switching further comprising the step of:

4   switching to said overlaid/underlaid sub-cell

5   structure when the results of said comparison indicate

6   that said number of said mobile stations having said

7   respective distance less than or equal to said distance

8   threshold is less than or equal to said channel

9   threshold.

1   26. The method of Claim 23, further comprising

2   the steps of:

3   initializing a timer, said step of measuring each

4   said respective distance being performed upon the

5   expiration of said timer.

1   27. The method of Claim 23, wherein said base

2   transceiver station has at least two transceiver units

3   associated therewith, each of said at least two

4   transceiver units having a respective one of said at

5   least two carrier frequencies associated therewith,

6   said step of switching further comprising the step of:

7   switching to said overlaid/underlaid sub-cell

8   structure by reducing the power to at least one of said

9   at least two transceiver units.

ABSTRACT OF THE DISCLOSURE

A telecommunications system and method is disclosed for adaptively configuring the cell structure of a cell having at least two carrier frequencies between an overlaid/underlaid (OL/UL) sub-cell structure and a normal cell structure based on the position of mobile stations within the cell. A Base Station Controller (BSC) for the cell determines the position of all of the mobile stations involved in a call connection within the cell relative to the cell site. If the number of mobile stations within a predefined distance from the cell site is greater than a channel threshold, the BSC adapts the cell configuration to the OL/UL sub-cell structure. The channel threshold is an operator-defined percentage of available channels (throughout the cell or within either the overlaid or underlaid cell). However, if the BSC determines that the percentage of mobile stations closer than the predefined distance is less than the channel threshold, the BSC maintains the normal cell structure.

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┌─────────────────────────────────────┐
│     Define  distance  threshold     │──── 100
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│      Define  channel  threshold     │──── 110
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│    Measure  MS's  distance  from  BTS │──── 120
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│    Determine  number  of  MS's  within │──── 130
│          distance  threshold        │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│  Compare  number  of  MS's  within  distance │──── 140
│    threshold  to  channel  threshold │
└─────────────────────────────────────┘
                  │
                  ▼
            ◇ OL/UL
            sub-cell          N    ┌──────────────────┐
            structure    ──────────│ Maintain  normal │──── 170
            needed ?               │  cell  structure │
            ◇ ── 150               └──────────────────┘
                  │ Y
                  ▼
┌─────────────────────────────────────┐
│   Change  to  OL/UL  sub-cell  structure │──── 160
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│          Initialize  timer          │──── 180
└─────────────────────────────────────┘
                  │
                  ▼
              ◇ Timer
        Y     expired
      ────────  ?
              ◇ ── 190
                  │ N
```
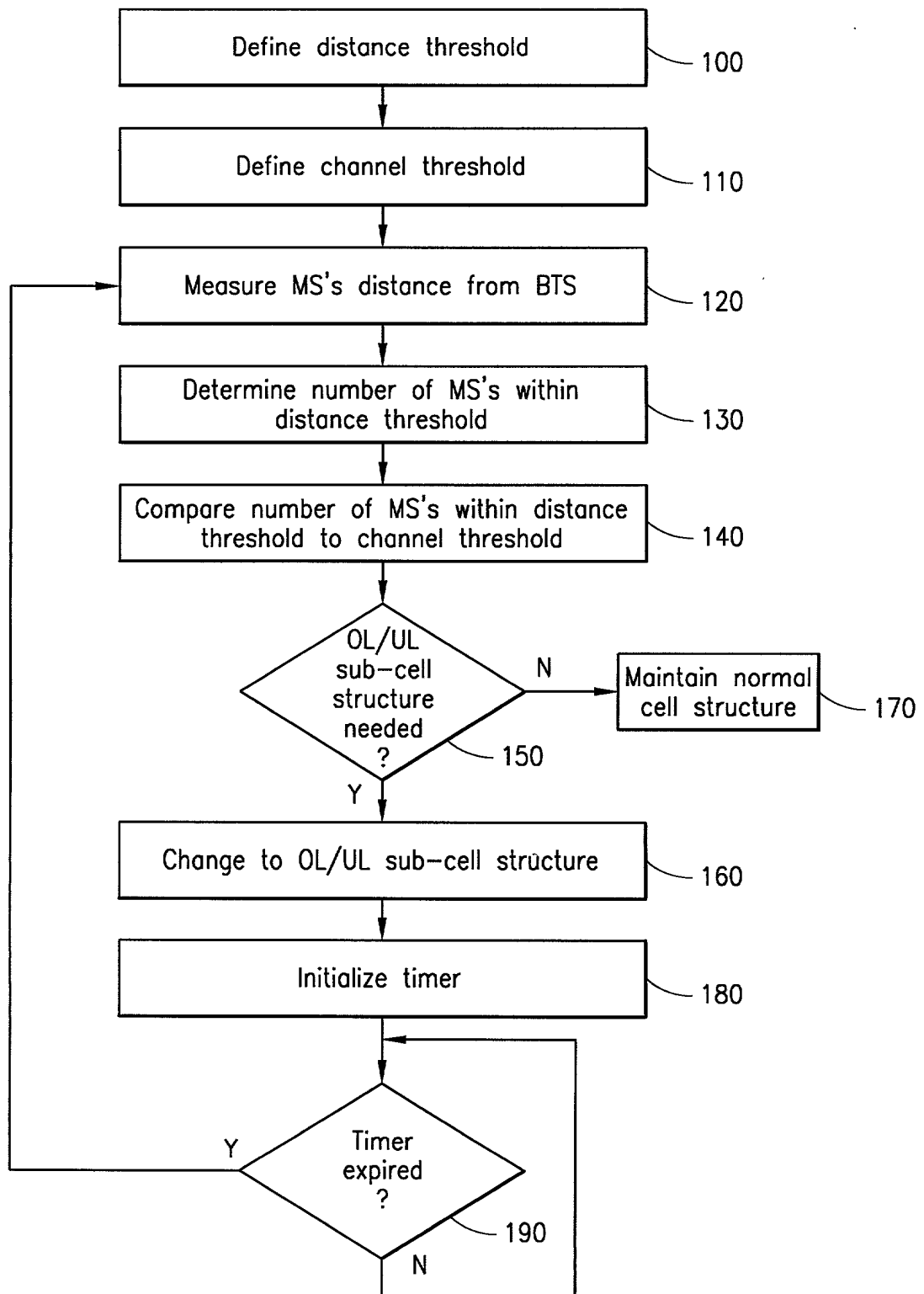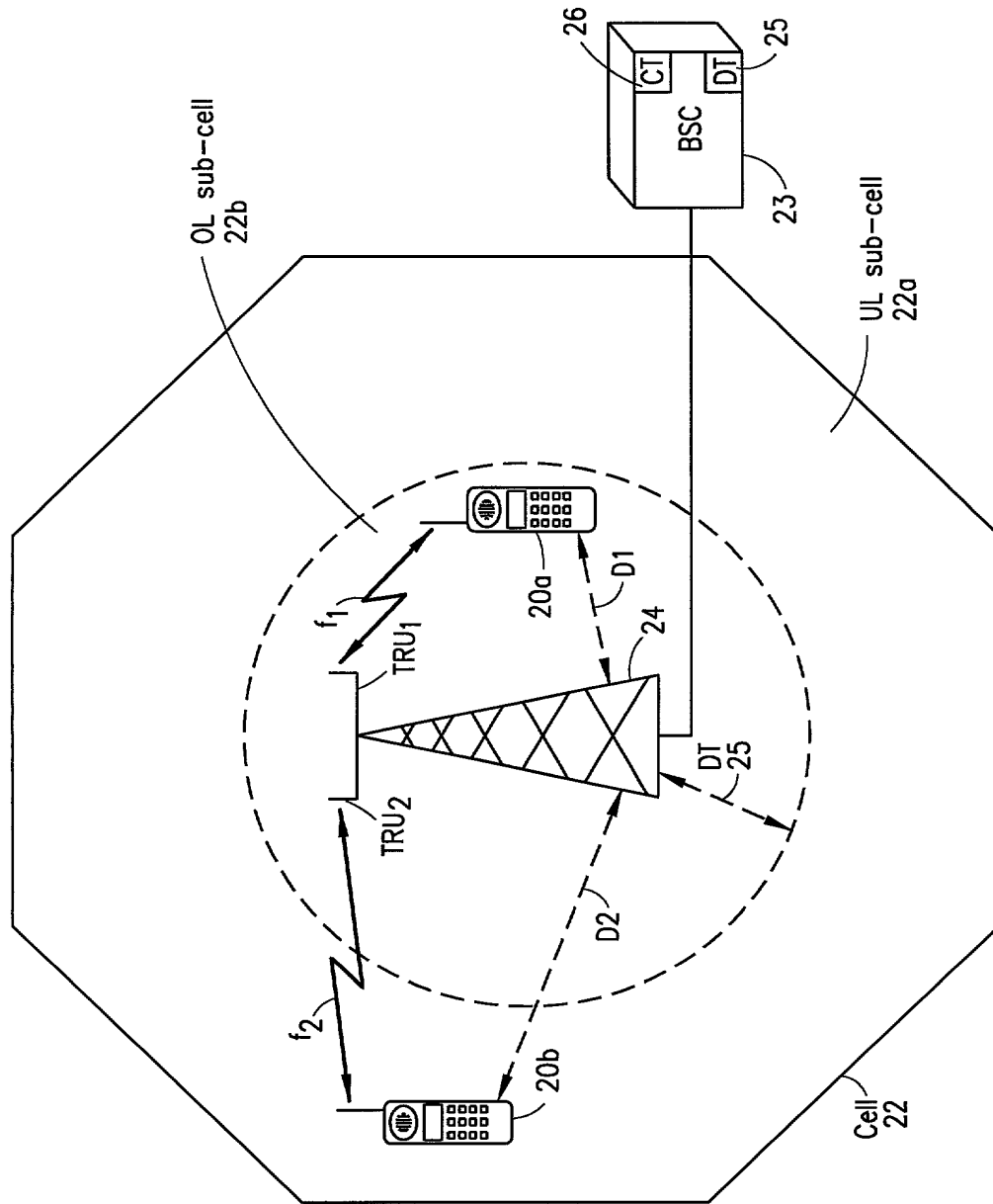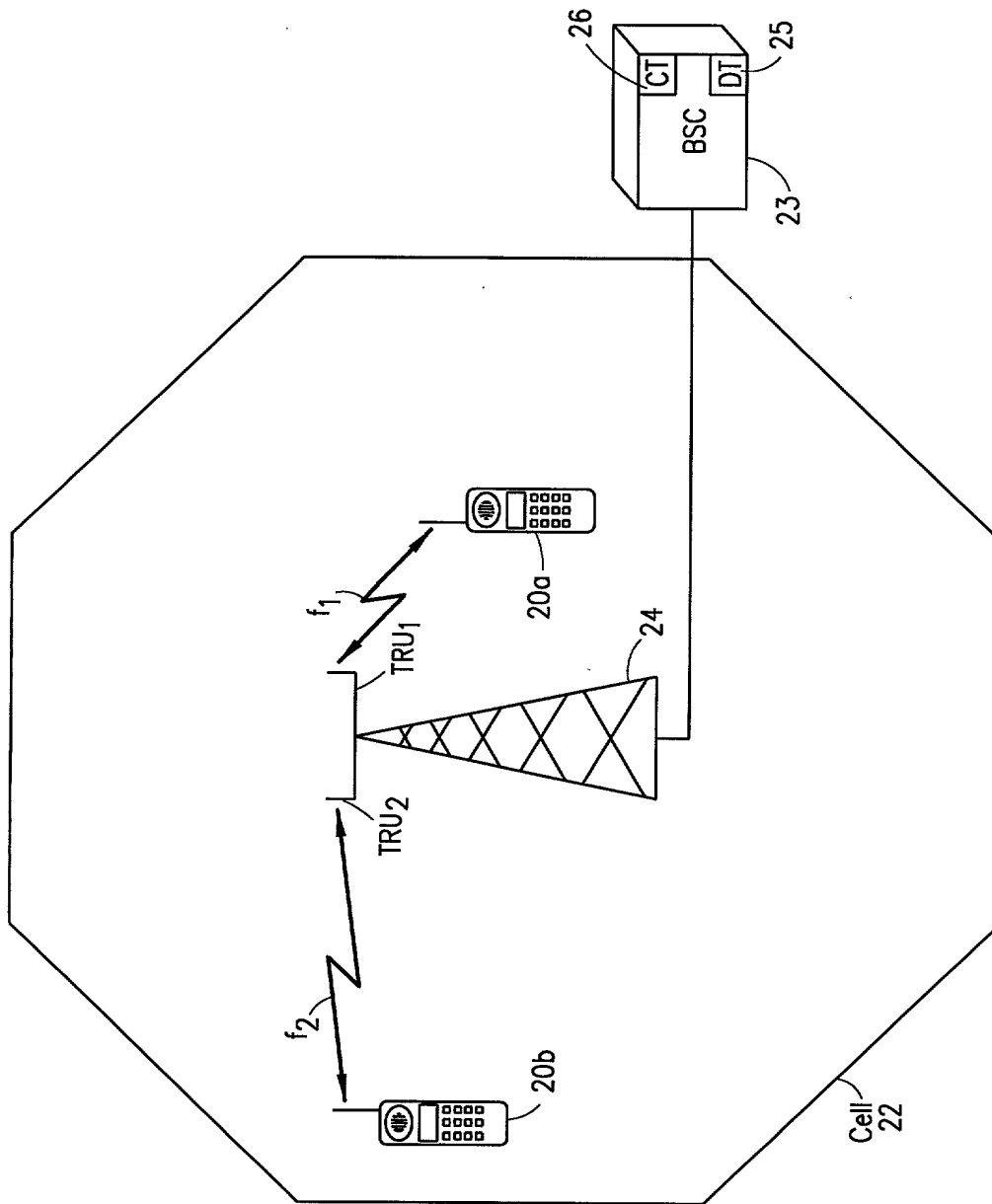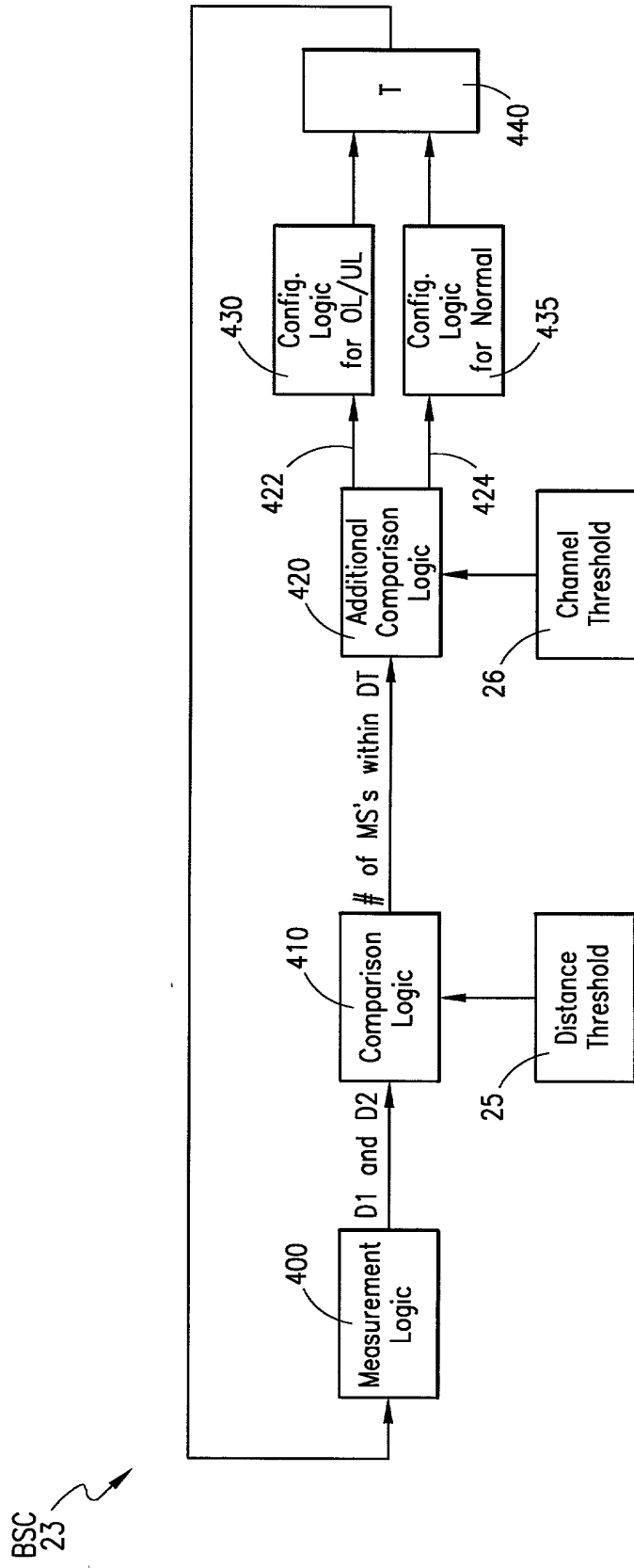
FIG. 1

FIG. 2

FIG. 3

FIG. 4

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name; and

I verily believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **SYSTEM AND METHOD FOR ADAPTIVE CONFIGURATION OF CELL STRUCTURE BASED ON THE POSITION OF MOBILE STATIONS**, the specification of which:

   X   is attached hereto.

   ___   was filed on _____, under Attorney Docket No. _____ and assigned Application Serial No. _____ _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to the patentability of this application as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of any application on which priority is claimed:

Country	Number	Date Filed	Priority Claimed
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose to the Office all information known to me to be material to patentability of the application as defined in 37 CFR § 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status (patented, pending)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

I hereby appoint the following attorneys and/or agents to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: CHARLES L. MOORE, JR., Reg. No. 33,742; DAVID G. MATTHEWS, Reg. No. 33,959; STEPHEN A. CALOGERO, Reg. No. 41,491; DAVID K. PURKS, Reg. No. 40,133; DEBRA K. STEPHENS, Reg. No. 38,211; KERMIT D. LOPEZ, Reg. No. 41,953; HERBERT V. KERNER, Reg. No. 42,271; MARK C. TERRANO, Reg. No. 40,200; KEVIN A. SEMBRAT, Reg. No. 36,673, and KENNETH W. BOLVIN, Reg. No. 34,125 of **ERICSSON INC.**, 1 Triangle Drive, Research Triangle Park, N.C. 27709, and THOMAS L. CRISMAN, Reg. No. 24,846; THOMAS L. CANTRELL, Reg. No. 20,849; STANLEY R. MOORE, Reg. No. 26,958; H. MATHEWS GARLAND, Reg. No. 19,129; GERALD T. WELCH, Reg. No. 30,332; ROGER L. MAXWELL, Reg. No. 31,855; P. WESTON MUSSELMAN, JR., Reg. No. 31,644; J. KEVIN GRAY, Reg. No. 37,141; JEFFERY E. BACON, Reg. No. 35,055; STEVEN R. GREENFIELD, Reg. No. 38,166; ANDRE M. SZUWALSKI, Reg. No. 35,701; STUART D. DWORK, Reg. No. 31,103; RUSSELL N. RIPPAMONTI, Reg. No. 39,521; RICHARD J. MOURA, Reg. No. 34,883; RAYMOND VAN DYKE, Reg. No. 34,746; BRIAN D. WALKER, Reg. No. 37,751; WILLIAM F. ESSER, Reg. No. 38,053; J. PAT HEPTIG, Reg. No. 40,643; HOLLY L. RUDNICK, Reg. No. 43,065; KEITH SAUNDERS; Reg. No. 41,462; SCOTT B. STAHL, Reg. No. 33,795; and WILLIAM J. TUCKER, Reg. No. 41,356 of the firm of **JENKENS & GILCHRIST**, 3200 Fountain Place, 1445 Ross Avenue, Dallas, Texas 75202-2799; and

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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